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Waste Not, Want Not: Managing Perishables in Small and Medium Retail Enterprises

Vlajic, J. V., Bogdanova, M., & Mijailovic, R. (2016). Waste Not, Want Not: Managing Perishables in Small and Medium Retail Enterprises. In K. S. Pawar, & K. M. Tsai (Eds.), *The Proceedings of 21st International Symposium on Logistics (ISL 2016)* (Vol. 21, pp. 259-268). Centre for Concurrent Enterprise, Nottingham University Business School.

Published in:

The Proceedings of 21st International Symposium on Logistics (ISL 2016)

Document Version:

Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:

[Link to publication record in Queen's University Belfast Research Portal](#)

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WASTE NOT, WANT NOT: MANAGING PERISHABLES IN SMALL AND MEDIUM RETAIL ENTERPRISES

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Abstract

Purpose of this paper:

Recent literature indicates that around one third of perishable products finish as waste (Mena et al., 2014): 60% of this waste can be classified as avoidable (EC, 2010) suggesting logistics and operational inefficiencies along the supply chain. In developed countries perishable products are predominantly wasted in wholesale and retail (Gustavsson et al., 2011) due to customer demand uncertainty the errors and delays in the supply chain (Fernie and Sparks, 2014). While research on logistics of large retail supply chains is well documented, research on retail small and medium enterprises' (SMEs) capabilities to prevent and manage waste of perishable products is in its infancy (c.f. Ellegaard, 2008) and needs further exploration.

In our study, we investigate the retail logistics practice of small food retailers, the factors that contribute to perishable products waste and the barriers and opportunities of SMEs in retail logistics to preserve product quality and participate in reverse logistics flows.

Design/methodology/approach:

As research on waste of perishable products for SMEs is scattered, we focus on identifying key variables that contribute to the creation of avoidable waste. Secondly we identify patterns of waste creation at the retail level and its possibilities for value added recovery. We use explorative case studies (Eisenhardt, 1989) and compare four SMEs and one large retailer that operate in a developed market. To get insights into specificities of SMEs that affect retail logistics practice, we select two types of food retailers: specialised (e.g. greengrocers and bakers) and general (e.g. convenience store that sells perishable products as a part of the assortment)

Findings:

Our preliminary findings indicate that there is a difference between large retailers and SME retailers in factors that contribute to the waste creation, as well as opportunities for value added recovery of products. While more factors appear to affect waste creation and management at large retailers, a small number of specific factors appears to affect SMEs. Similarly, large retailers utilise a range of practices to reduce risks of product perishability and short shelf life, manage demand, and manage reverse logistics practices. Retail SMEs on the other hand have limited options to address waste creation and value added recovery. However, our findings show that specialist SMEs could successfully minimize waste and even create possibilities for value added recovery of perishable products. Data indicates that business orientation of the SME, the buyer-supplier relationship, and an extent of adoption of lean principles in retail coupled with SME resources, product specific regulations and support from local authorities for waste management or partnerships with other organizations determine extent of successful preservation of a product quality and value added recovery.

Value:

Our contribution to the SCM academic literature is threefold: first, we identify major factors that contribute to the generation waste of perishable products in retail environment; second, we identify possibilities for value added recovery for perishable products and third, we present opportunities and challenges for SME retailers to manage or participate in activities of value added recovery. Our findings contribute to theory by filling a gap in the literature that considers product quality preservation and value added recovery in the context of retail logistics and SMEs.

Research limitations/implications (if applicable):

Our findings are limited to insights from five case studies of retail companies that operate within a developed market. To improve on generalisability, we intend to increase the number of cases and include data obtained from the suppliers and organizations involved in reverse logistics flows (e.g. local authorities, charities, etc.).

Practical implications (if applicable):

With this paper, we contribute to the improvement of retail logistics and operations in SMEs which constitute over 99% of business activities in UK (Rhodes, 2015). Our findings will help retail managers and owners to better understand the possibilities for value added recovery, investigate a range of logistics and retail strategies suitable for the specificities of SME environment and, ultimately, improve their profitability and sustainability.

Key words: product quality preservation, value added recovery, retail logistics

INTRODUCTION

Recent literature indicates that around one third of food products are wasted (Gustavsson et al., 2011), despite raising concerns about food security (Papargyropoulou et al., 2014), and the environmental impact that results from food production, processing and consumption (Mena et al., 2011). Additionally, research conducted in UK shows that more than 80% of food and drink waste (measured by weight) is possibly avoidable (EC, 2010), which indicates managerial, technical or organizational challenges in food supply chains (c.f. Apte, 2010). In developed countries most food waste occurs after processing, i.e. in distribution and retail channels. While food logistics is well documented in large retail systems, there is a lack of empirical research on food logistics in small and medium enterprises (SMEs) (Bernon and Cullen, 2007). Moreover, research findings into SMEs are segmented by the type of SME (Ellegaard 2008) or region of data collection (Bourlakis et al., 2014; Vlajic, 2016). To the best of our knowledge, there is no research that empirically investigates the retail logistics practice of small food retailers, the factors that contribute to perishable products waste and the barriers and opportunities of SMEs in retail logistics to preserve product quality and participate in reverse logistics flows.

The paper is structured to provide a theoretical background on circular supply chains in the context of perishable products and the position and role of SME retailers. There follows a description of the methodology used in our investigation, presentation of key findings and a discussion of issues arising from the cross-case analysis. We conclude with remarks and suggestions for further research.

A FRAMEWORK FOR MANAGING PERISHABLE PRODUCTS IN CIRCULAR SUPPLY CHAINS

In this section, we describe the research framework for managing circular flows of perishable products (Figure 1). The framework combines the work of Carter and Ellram (1998) and Rahman, (2012). Generally, the supply chain consists of suppliers, producers, distribution centres (wholesalers or warehouses) and retail outlets, as well as raw materials, work-in-process inventory and finished products that flow between facilities (Simchi-Levi et al., 2008). This flow is considered as forward logistics flow, where production and physical movement of the product and the means of creating the

exchange are *value adding* (VA) processes (Christopher, 2011). Supply chains consist of primary and supporting supply chain members (Lambert and Cooper, 2000): VA processes are performed by the primary members, while supporting members provide resources, knowledge, utilities or assets to the primary members of the supply chains. In our framework we refer to the supporting members as secondary markets, such as governmental bodies, energy companies, local authorities responsible for waste collection, food banks and charities.

Alongside the forward logistics flow there is the reverse logistics flow, which is “the movement of product or materials in the opposite direction for the purpose of creating or recapturing value, or for proper disposal”, (Tibben-Lembke and Rogers, 2002, p. 271).

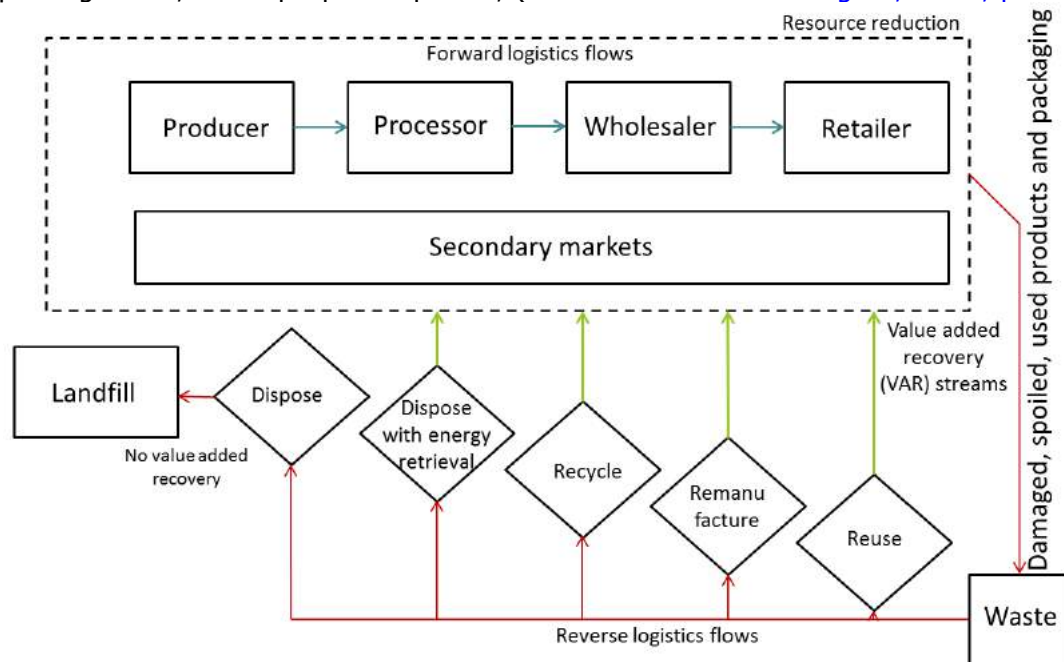


Figure 1. Framework for managing perishable products in circular supply chains

Damaged, spoiled, used products, packaging and other types of waste, as well as logistics units are all to be found in the reverse logistics flow. Waste generation occurs throughout the supply chain due to various *internal* factors (e.g. company's organization, planning and control, resources, information system or relationship with the suppliers), and *external* factors (e.g. environmental, legal, technological, market, etc.), (c.f. Vlajic et al., 2012). In our framework, we focus on the waste related to food and its packaging.

In their early work on reverse logistics, Carter and Ellram (1998) proposed the reverse logistics hierarchy, which consists of five processes: reduce, reuse, recycle, dispose with energy retrieval and dispose in landfill. They state that *resource reduction* is the ultimate goal in the reverse logistics process, as it minimizes materials “used in a product and minimisation of waste and energy achieved through the design of more environmentally efficient products” (p. 91). This view is broadly the same as that introduced by the European Parliamentary Council in 2008 (EPC, 2008). In the latter framework, these processes are seen as waste prevention, i.e. processes that avoid waste generation (Papargyropoulou et al., 2014). *Prevention* of food waste considers good manufacturing and logistics practice aimed to preserve food quality and safety, such as maintenance of the cold chain, use of protective packaging where needed, and proper product handling (van der Vorst et al., 2005). Prevention also considers tackling sources of food loss and waste related to product risks, demand uncertainty, consumer behaviour, ordering, inventory management and sale policies, supply chain operations or variety of external factors (Vlajic et al., 2012).

Carter and Ellram (1998) state that the after resource reduction, maximal recovery value can be obtained in reverse logistics flow, i.e. by reuse, recycling and disposal with energy recovery and in the last resort disposal. Later research added re-manufacturing, as a process distinct from reuse. Rahman, (2012) defines *reuse* as a “process in which

recovered product is used again for a purpose similar to the one for which it was originally designed”, *remanufacturing*, as a “process of reducing a product into its constituent parts”, i.e. it requires disassembly and *recycling* as the process of collecting and disassembling used products, components and materials, separating them into categories and processing them into recycled materials. Recycled materials do not retain functionality of used parts of products.

In the context of food supply chains, typical example of *reuse* occurs when food surplus is redistributed to day centres and night shelters for homeless people (Cherrett et al., 2015). These activities are supported by various organizations at national, regional and local levels, such as FareShare. *Re-manufacturing* of food products is often considered together with recycling. In our view, use of fresh food as a resource for production of animal or pet food requires separation of good quality and spoiled fractions of products (Stenmarck et al., 2011), which corresponds to the definition of the re-manufacturing. *Recycling* of the food waste typically considers transformation to composts, while *disposal with energy recovery* typically considers anaerobic digestion (Papargyropoulou et al., 2014) or incineration (Stenmarck et al., 2011). The distinction between recycling and disposal with energy recovery is sometimes blurred, as some methods (e.g. in-vessel tunnelling) produce both, recycled material and energy (DAERA, 2013).

Waste products in reverse logistics flows are part of value added recovery (VAR) streams, i.e. streams that pass through re-use, re-manufacturing, recycling or disposal with energy recovery processes. Depending on the type of the product and type of the supply chain, the destination of the VAR stream can be different (Tibben-Lembke and Rogers, 2002; de Brito and Dekker, 2003): products might return to the original suppliers, or to some supply chain member, or they might be delivered to one of supporting members, i.e. on the secondary market, such as second-hand shops, charities, or energy companies.

RETAILERS’ POSITION IN CIRCULAR FLOWS OF FOOD SUPPLY CHAINS

Within the food supply chain retailers take a specific position: they are at the end of the forward logistics flow, and as such they are impacted by disturbances in material flows and activities of other supply chain members (Fernie and Sparks, 2014). A considerable body of literature indicates that large retailers are powerful, focal companies of their supply chains (Coe and Hess, 2005; Fernie and Sparks, 2014), with a commitment to waste prevention and reduction, as well as involvement into reverse flows (McKinnon and Edwards, 2014). On the other hand, the majority of authors agree that SMEs are not competitive due to smaller variety and volume of products, higher capital and transaction costs, a reactive nature in the company’s strategies, and the presence of limited resources (Arend and Wisner, 2005; Thun et al., 2011). Cagliano et al., (2001) suggests that small firms have less insight into actual costs of their operations, as well as poorer and incomplete understanding of operations combined with management practice based on local and contingency factors. However, SMEs are often characterized by informal exchanges of information between employees (Roebuck et al., 1995), knowledge of local markets, knowledge-based advantages (Arend and Wisner, 2005) and flexible organizational structure (Vaaland and Heide, 2007), which indicate SMEs’ advantages over larger enterprises. Bourlakis et al. (2014) found that a company’s performance relates to its size: in comparison with small and medium enterprises, micro companies do better on gross profit margin but worse on waste, flexibility in extra volume orders and delivery of products according to the specification. It is also noticeable that the majority of research is focused on manufacturing SMEs (see work of Cagliano et al., 2001, Ellegaard, 2008), while there is considerably less research focused on service and retail SMEs. Ellegaard, (2008) even concluded that findings related to the manufacturing SMEs might not be applicable to service or retail oriented SMEs.

Based on the reviewed literature, it is inconclusive how retail SMEs manage return flows, i.e. what is extent of their participation in VAR. In our study, we investigate the retail logistics practice of retail SMEs to identify major factors that contribute to perishable products waste, as well as possibilities for waste prevention and VAR.

METHODOLOGY

In this study, we apply multiple case study methodology. This methodology is based on the replication strategy (Yin, 2014), which allows strengthening the precision, validity, stability and trustworthiness of the findings (Miles et al., 2014). An explorative approach is better suited to identify patterns (Eisenhardt, 1989) relevant for waste creation, its prevention and management of VAR flows.

Selection of the companies was based on the hygiene rating score by the Food Standards Agency (FSA) (<http://ratings.food.gov.uk>). The FSA assesses three elements: hygiene of food handling (storing, cooling, etc.), the condition of the structure of the buildings (the cleanliness, lightning, layout, etc.) and management of the business (recording data, ensuring food safety, etc.). The higher score implies better hygiene policy. Data collection about their supply chain was based on snowball sampling, which benefits inductive, theory building analysis (Miles et al., 2014).

Our investigation is based on five case studies of food retailers (Table 1). The unit of analysis is a company. In all cases we considered both packed and unpacked fresh products. To distinguish differences in opportunities, barriers and practices between different retailers, we compare large supermarket with high hygiene score and range of employed practices on product quality preservation and VAR processes, and retail SMEs. To address the challenges small retailers face, we selected stores with higher and lower hygiene rating scores. To capture specificities of retail SMEs in retail logistics, we select specialised and general type of retail SMEs. Key retail logistics tasks are related to management of storage facilities, inventory, transportation, unitization and packaging and communications (Fernie and Sparks, 2014).

Following instruction of Yin (2014), the case study protocol comprised of the following parts: general (project information, data about the company, interviewee), key retail logistics tasks, products and their estimated quantities and causes of product waste, as well as the retailer's strategies to manage perishable products and waste.

Case	Type of retail outlet	Function of interviewee	Waste level	Hygiene rating	Data collection
1	Specialized, grocery shop	Owner, store and purchasing manager	Low	4	I, F/O
2	Specialized, grocery shop	Owner, store and purchasing manager	Low-medium	3	I, F/O
3	Specialized, bakery	Store manager, main baker	Low	4	I, F/O
4	General, convenience shop	Owner, store and purchasing manager	Low-medium	4	I, F/O
5	Supermarket	Corporate Affairs Manager	Low	5	I, F/O

Legend: I – interview; F – Field visit; O – observation

Table 1 – Cases selected and data collection

Data collection is based on semi-structured interviews with the company managers. All interviewees were required to have experience in the food retail industry. Interviews were scheduled in 2015 and 2016, each lasted between 1 and 4 hours. Ten interviews were conducted with retailers, with ten field visits and observations. Where agreed, interviews were recorded and transcribed otherwise interviewers made detailed notes during the conversation. To validate data, in addition to interviews we noted personal observations during the field visit, consulted public and company documentation for additional insights, and conducted interviews with suppliers and local authorities responsible for waste collection.

FINDINGS AND DISCUSSION

Due to constraints of space we present cross-case analysis and key findings related to the main factors that contribute to the waste generation and main strategies retailers use in circular supply chains (Table 2). In analysis of factors that contribute to waste generation, we considered the product characteristics, internal and external factors.

In line with findings in Mena et al. (2014), our research showed the common denominator among food waste factors regardless of the size and type of retailer is related to the 'supply chain' – in particular demand characteristics, such as customers' preference for fresh food, uncertainty of demand or returns from customers. However, the relevance of other supply chain factors is not the same for all retailers: while large companies focus on sources of food waste that arise from complexity of their supply chain and organization of logistics operations, retail SMEs are affected by the operational faults in the supply chain, as well as by policies set by suppliers. This is very apparent in Case 4, where the retail SME is conditioned by the supplier's demand of minimum order size and a no return policy while experiencing low demand for food products.

Analysis of product and company factors, as well as external factors, indicates that waste generation at large retailers is affected by a larger number of factors, while retail SMEs are affected by the smaller number of specific factors, such as lack of resources for maintenance of the cold chain (Cases 1 and 2) or lack of support for waste collection (Cases 2 and 3) or waste separation (Case 4) by the local authorities. Root cause analysis shows that location, layout and accessibility of the outlet, as well as outsourcing of waste collection are important factors that might act as sources of waste generation in retail SMEs, and as barriers or opportunities for product quality preservation and VAR.

In analysis of retail SMEs waste prevention and VAR strategies, we compared large retailers and retail SMEs, and then specialist and general types of retail SMEs (Table 2).

Principles and Strategies	Case 1	Case 2	Case 3	Case 4	Case 5
Estimated waste prevention	++*	++*	+++*	++*	++++*
<ul style="list-style-type: none"> Adequate resources Innovative packaging solutions Operational planning and control/measurement[#] Collaboration with the suppliers Demand management: customer information, communication, education Promotion 	⊕⊕⊕*	⊕⊕	⊕⊕⊕	⊕	⊕⊕⊕⊕* [#]
Estimated value added recovery	++++*	++++	++++*	+++	++++*
Reuse (re-distribution)	+	++	++	+	++
<ul style="list-style-type: none"> Returns to the supplier Re-distribution 	⊕	⊕	⊕	⊕ ⁿ	⊕⊕*
Re-manufacturing	+++	+	++		+
<ul style="list-style-type: none"> Pet-food Prepared food Ready meals Ingredients 	⊕⊕	⊕	⊕		⊕*
Recycling	+	+	++	+	
<ul style="list-style-type: none"> in-vessel composting transformation to raw materials 	⊕	⊕	⊕	⊕	
Disposal with energy recovery	+	+	+	+	+
<ul style="list-style-type: none"> Anaerobic digestion in-vessel composting 					⊕*

* - Strategies identified by interviewees as the most used in retail SMEs for value adding recovery

+ - Estimated extent of the strategy used; ⊕ - The strategy; n - Strategies introduced in 2016

Table 2. The key principles and strategies used in food waste minimisation and VA retrieval

The large retailer (Case 5) deploys a range of principles and strategies, focusing on both, waste prevention and VAR strategies. This is not surprising, as the large retailers

typically have sufficient resources and power to tackle internal and external waste sources by ensuring control of the chain (Fearne et al., 2005), investing in packaging, information technology and labelling solutions (Thun et al., 2011), as well as tracing systems that enables visibility and monitoring of food waste (Stenmarck et al., 2011). In the case 5, for example, the large retailer had not only invested in innovative packaging solutions that would extend product shelf-life, but also in media and expert groups that shape demand. The retail SMEs (Cases 1 to 4) on the other hand tend to focus on a smaller number of selected strategies deployed to tackle specific, internal waste sources related to consumer behaviour, purchasing conditions or product quality/freshness. Application of these strategies is under control of the shop managers. We formulate following proposition: *Retail SMEs engage less with waste prevention and VAR than the large retailer.*

Food waste prevention is associated with creation and preservation of the product quality along the chain. Food supply chains are controlled by the powerful supermarkets which coordinate and monitor forward logistics flows (Hingley, 2005). Independent retail SMEs are typically involved into looser collaborative supply chains, as many of food chains are based on informal relationships between buyers and suppliers (Ilbery and Maye, 2005; Trienekens and Zuurbier, 2008). Thus, they are very much impacted by the strategies and disturbances occurred in the supply part of the chain and prevention is localised to their own company. Retail SMEs are not able to invest into innovative packaging solutions, and they do not practice demand management. These strategies require significant financial resources, technology, time and personnel, which is limited for small retailers (c.f. Bourlakis et al., 2014). Moreover, they have low purchasing power and influence on the supplier's strategies and other supply chain members (Thun et al., 2011). In such a situation, retail SMEs (cases 1 to 4) have limited options: a) they practice lean approach to purchasing, e.g. small, but frequent orders, fast inventory rotation and early detection of spoiled/damaged products and their separation from the batch (Cases 1 and 2), and minimal inventory (Cases 1, 3 and 4) b) they utilise product specific VAR activities suitable for small economy of scale operations. We formulate following proposition: *Retail SMEs engage into VAR activities more than in waste prevention.*

Finally, it is interesting to observe differences between retail logistics of a specialist and general types of retail SMEs: specialist retail SMEs appear to deploy more strategies for VAR than the general ones. Specialist stores appear to be more opportunities for re-manufacturing, at their site: for example, slightly bruised fruits are removed and used for preparation of fruit salads (Case 1), vegetables that started losing freshness are wrapped and packed (Case 2), bread is transformed to crisps or bread-crumbs (Case 3). Additionally, surplus of fresh products are donated to shelters or charities that prepare and distribute meals to vulnerable people (Cases 2 and 3). Contrary to specialist shops, convenience shop (Case 4) has fewer opportunities for VAR: it appears that there is lack of space, time and knowledge about possibilities for product transformation. We formulate following proposition: *Specialist retail SMEs engage more into VAR activities than general stores.*

CONCLUSION

Food supply chains are characterized by specific logistics activities and return flows. While a rich body of literature exists on topics related to managing perishable food products for large food companies, empirical research on return flows in food supply chains from the aspect of retail SMEs is under-researched.

Our preliminary findings indicate that a common denominator in waste generation for retailers is their supply chain, in particular the uncertainty of customer demand. Analysis of other factors showed that there is a difference between large retailers and SME retailers in factors that contribute to the waste creation, as well as opportunities for VAR of products. While more factors appear to affect waste creation and management at large retailers, a small number of specific factors appear to affect SMEs.

The analysis of waste prevention and VAR activities shows that large retailers utilise a range of practices to reduce risks of product perishability and short shelf life, manage

demand, and manage reverse logistics practices. Retail SMEs on the other hand use specific strategies to participate in VAR, while coping with multiple constraints when addressing waste generation. However, our findings show that specialist SMEs minimize waste successfully by combining lean principles in purchasing and specific VAR activities for perishable products.

Our contribution to the SCM academic literature is threefold: first, we identify major factors that contribute to the waste generation of perishable products in the retail environment; second, we identify possibilities for VAR of perishable products by retail SMEs and third, we provide insight into opportunities and challenges for SME retailers to manage or participate in VAR. Moreover, though [Ilomaki and Melanen \(2001\)](#) found that micro and small enterprises are not interested in waste management due to lack of time and knowledge, and the small impact it has on their businesses, we found that small food retailers in UK consider waste prevention and management an integral part of their business strategy. Thus, our findings contribute to current theory by presenting data that fills a gap in the literature that considers product quality preservation and VAR in the context of retail logistics and SMEs. Previously, this kind of study has rarely been supported by empirical data ([Bernon and Cullen, 2007](#)).

With this paper, we contribute to the improvement of retail logistics and operations in SMEs which constitute over 99% of business activities in UK ([Rhodes, 2015](#)). Our findings will help retail managers and owners to better understand the possibilities for VAR, and to investigate a range of logistics and retail strategies suitable for the specificities of the SME environment, and ultimately improve their profitability and sustainability.

ACKNOWLEDGMENTS

This research is the first part of the project: *Waste Not, Want Not: Contributing to a Sustainable Food Industry by Managing Food Waste*, sponsored by the Centre for Irish Business and Economic Business, Queen's University Belfast (QUB). We would also like to thank Belfast Food Network, the Science Shop at QUB and small retailers in Belfast who supported this research.

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